User's Manual

Model FU20
pH/ORP Sensor

IM 12B07K02-01E

vigilantplant.®

YOKOGAWA
Yokogawa Electric Corporation

IM 12B07K02-01E
3rd Edition

INTRODUCTION

This user's manual provides information for the installation and use of the FU20 pH/ORP sensor. The FU20 is the choice for the majority of typical waste water and process applications.

Upon delivery, unpack the sensor carefully and inspect it to ensure it was not damaged during shipment. If damage is found, retain the original packing materials (including outer box) and then immediately notify the carrier and the relevant Yokogawa sales office. Make sure the Model Code on the sensor is the same as on the packing list. For details of the Model Code, refer to Sec. 1.2.

Other related items are described in the following manuals.

Model	Title	IM No.
FLXA202, FLXA21	2-Wire Liquid Analyzer	IM 12A01A02-01E
PH450G	4-wire pH/ORP Converter	IM 12B07C05-01E

Media No. IM 12B07K02-01E 3rd Edition : Nov. 2015 (YK)
All Rights Reserved Copyright © 2000, Yokogawa Electric Corporation

◆ For the safe use of this equipment

■ Safety, Protection, and Modification of the Product

- In order to protect the system controlled by the product and the product itself and ensure safe operation, observe the safety precautions described in this user's manual. We assume no liability for safety if users fail to observe these instructions when operating the product.
- If this instrument is used in a manner not specified in this user's manual, the protection provided by this instrument may be impaired.
- Be sure to use the spare parts approved by Yokogawa Electric Corporation (hereafter simply referred to as YOKOGAWA) when replacing parts or consumables.
- Modification of the product is strictly prohibited.

■ Notes on Handling User's Manuals

- Please hand over the user's manuals to your end users so that they can keep the user's manuals on hand for convenient reference.
- Please read the information thoroughly before using the product.
- The purpose of these user's manuals is not to warrant that the product is well suited to any particular purpose but rather to describe the functional details of the product.
- No part of the user's manuals may be transferred or reproduced without prior written consent from YOKOGAWA.
- YOKOGAWA reserves the right to make improvements in the user's manuals and product at any time, without notice or obligation.
- If you have any questions, or you find mistakes or omissions in the user's manuals, please contact our sales representative or your local distributor.

■ Warning and Disclaimer

The product is provided on an "as is" basis. YOKOGAWA shall have neither liability nor responsibility to any person or entity with respect to any direct or indirect loss or damage arising from using the product or any defect of the product that YOKOGAWA can not predict in advance.

■ Signal Words

The following words are used in this manual.

CAUTION

This symbol gives information essential for understanding the operations and functions.

NOTE

This symbol indicates information that complements the present topic.

After-sales Warranty

- Do not modify the product.

- During the warranty period, for repair under warranty consult the local sales representative or service office. Yokogawa will replace or repair any damaged parts. Before consulting for repair under warranty, provide us with the model name and serial number and a description of the problem. Any diagrams or data explaining the problem would also be appreciated.
  - If we replace the product with a new one, we won't provide you with a repair report.
  - Yokogawa warrants the product for the period stated in the pre-purchase quotation Yokogawa shall conduct defined warranty service based on its standard. When the customer site is located outside of the service area, a fee for dispatching the maintenance engineer will be charged to the customer.
  - Returned goods that have been in contact with process fluids must be decontaminated and disinfected prior to shipment. Goods should carry a certificate to this effect, for the health and safety of our employees. Material Safety Data sheets must be included for all components of the process to which the sensor have been exposed.

- In the following cases, customer will be charged repair fee regardless of warranty period.
  - Failure of components which are out of scope of warranty stated in instruction manual.
  - Failure caused by usage of software, hardware or auxiliary equipment, which Yokogawa Electric did not supply.
  - Failure due to improper or insufficient maintenance by user.
  - Failure due to modification, misuse or outside-of-specifications operation which Yokogawa does not authorize.
  - Failure due to power supply (voltage, frequency) being outside specifications or abnormal.
  - Failure caused by any usage out of scope of recommended usage.
  - Any damage from fire, earthquake, storms and floods, lightning, disturbances, riots, warfare, radiation and other natural changes.

- Yokogawa does not warrant conformance with the specific application at the user site. Yokogawa will not bear direct/indirect responsibility for damage due to a specific application.

- Yokogawa Electric will not bear responsibility when the user configures the product into systems or resells the product.

- Maintenance service and supplying repair parts will be covered for five years after the production ends. For repair for this product, please contact the nearest sales office described in this instruction manual.

Blank Page

Model FU20
pH/ORP Sensor

IM 12B07K02-01E 3rd Edition

CONTENTS

◆ INTRODUCTION....i
◆ For the safe use of this equipment....ii
◆ After-sales Warranty....iii
1. Specification....1-1
1.1 Standard Specifications....1-1
1.2 Model and Suffix codes....1-1
1.3 External Dimensions....1-2
2. Installation and Wiring....2-1
2.1 Installation....2-1
2.2 Wiring....2-1
3. Maintenance....3-1
Revision Information....i

Blank Page

1. Specification

The Model FU20 offers a simple and cost effective solution for a wide variety of waste water and process applications. This all-in-one sensor provides simultaneous measurement of pH, ORP and temperature. The rugged Ryton body is designed for easy installation into on-line via the 3/4 inch tapered threaded connections provided on both ends of the sensor.

1.1 Standard Specifications

Measuring range: pH; 2 to 12 ORP; -1500 to 1500 mV

Solution temperature : -5 to 105°C (sensor only, sample is not freezed)

Solution pressure : 0 to 1 MPa (sensor only)

Solution conductivity : 50 µS/cm or higher

Solution flow velocity : 2 m/s max.

Internal electrolyte: Saturated KCl (Non refillable)

Temperature sensor : Pt1000 (Note)

Body materials: Ryton (PPS 40GF)

Weight: Approx. 0.5 kg (Body)

Storage temperature: -10 to 50 °C

Applicable Liquid Analyze/converter: FLXA202/FLXA21 2-Wire Liquid Analyze, PH450G pH/ORP converter.

Applicable holder: Special order for PH8HG, HH350G with optional adapter, cannot be used with HH350G/-JT.

Note: The temperature sensor included in the FU20 is intended to provide indication and cell compensation. The construction has not been tested to the pressure vessel standards required for plant temperature control.

NOTE

Cautions for using the FU20 sensor

Note that the FU20 sensor has limited life which depending on installation process.

Be careful not to allow liquid junction and glass of the pH sensor to dry out.

When storing the sensor, be sure to attach the protective cap (supplied with it on shipment) to its tip.

The sensing glass membrane of the pH sensor gradually deteriorates during storage.

A virgin pH sensor may become unusable because of its deterioration. Avoid storing the sensor for a long time (Use within a year is recommended).

1.2 Model and Suffix codes

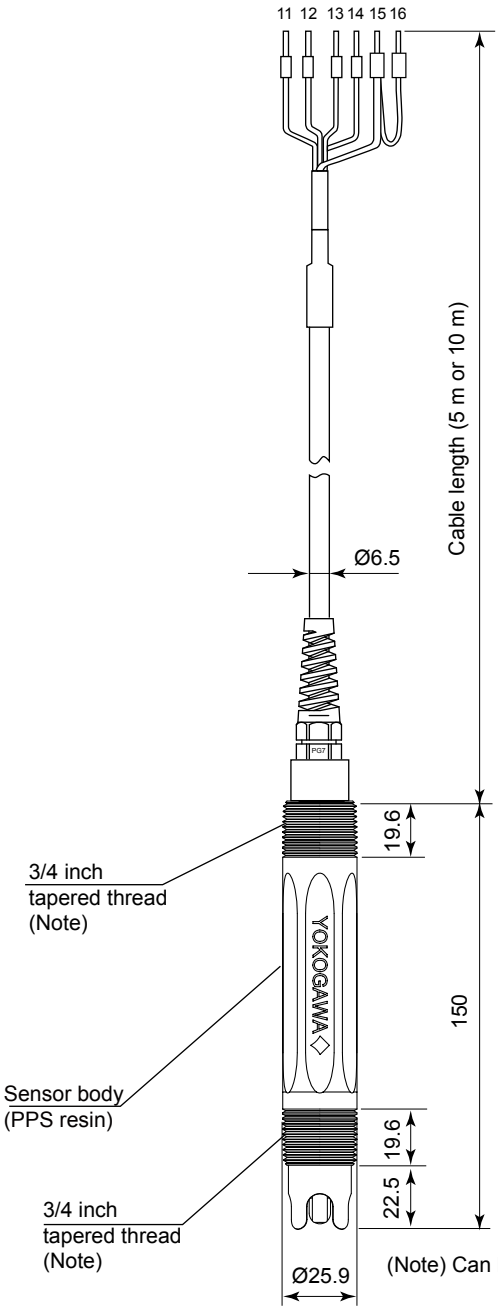
Model	Suffix Code	Option Code	Description
FU20	.....	.....	Wide body Sensor
Type	**-05** **-10**	....	Fixed cable 5 meter Fixed cable 10 meter
Temperature element	**-T1**	.....	Pt1000
Model	**-NPT**	.....	Dome shape model

Note: Special order is needed for using with PH8HG drop-in guide pipe.

1.3 External Dimensions

Unit: mm

Standard type (FU20-□□-T1-NPT)



(Note) Can be fixed to 3/4NPT female screw.

Figure 1.1 FU20 pH/ORP Sensor

2. Installation and Wiring

2.1 Installation

For optimum measurement results, the FU20 should be installed in a location that offers an acceptable representation of the process composition and DOES NOT exceed the specifications of the sensor.

This sensor should be installed rain-proof or drip-proof area where rainwater cannot get inside through the cable inlet/outlet, because insulation of sensor will be decreased due to exposure to rain or due to condensation at a high humid place.

Take care that screw-in force is not too large.

Special orderis needed for using with PH8HG drop-in guide pipe.

In-line Installation

The FU20 sensor is designed for in-line installation, via a bypass loop as an immersion assembly. For best results the FU20 should be mounted with the process coming towards the sensor and positioned at least 15° above the horizontal plane to eliminate air bubbles in the glass bulb. The FU20 can be mounted using the threads on the sensor body (Figure 2.1).
Apply Teflon tape to the appropriate threaded end, then install in the process.

How to apply Teflon tape: Apply seven turns or more Teflon tape from the thread end in piles (thickness of tape: approximately 0.1 mm, width of tape: approximately 13 mm).

Apply more turns of Teflon tape for leakage.

Screw-in torque of sensor is approximately 4 N·m.

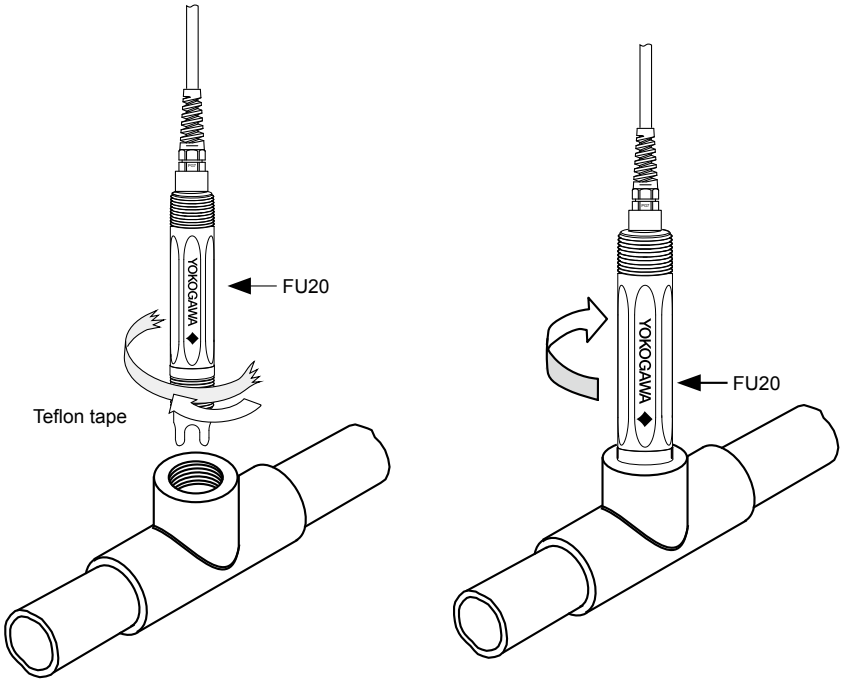


Figure 2.1 In-line Installation

2.2 Wiring

Mark band of sensor is shown by numeral and pin terminals are used, connect each core wire to the corresponding terminals of transmitter or converter. For details of wiring, refer to relevant IMs of transmitter or converter.

For pH and ORP measurement

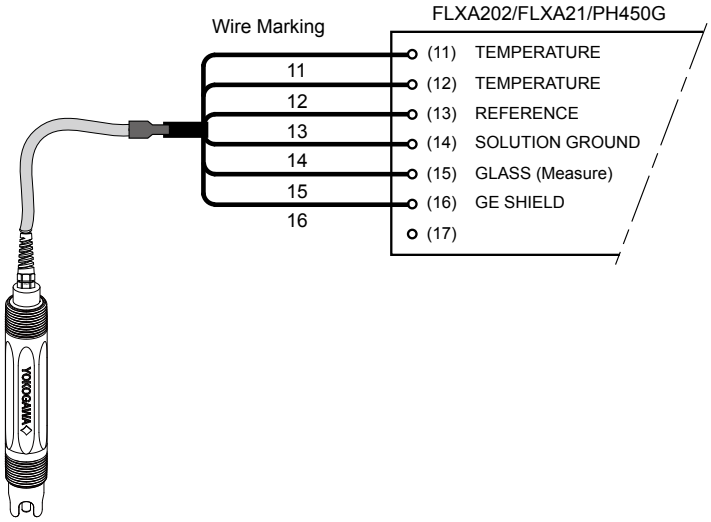


Figure 2.2 Sensor Wiring for pH and ORP measurement

For pH measurement

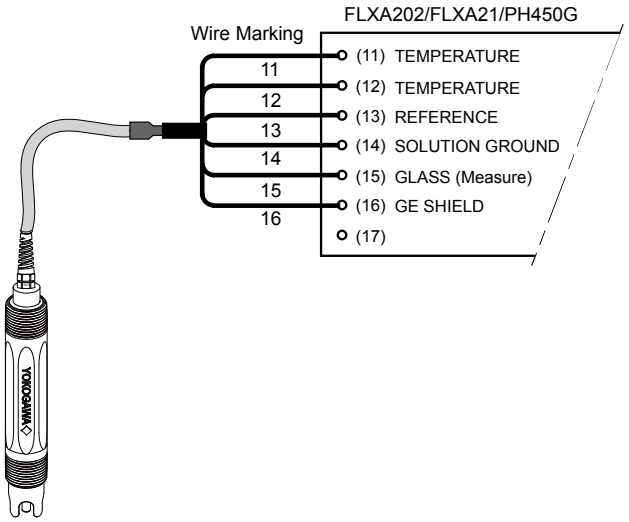
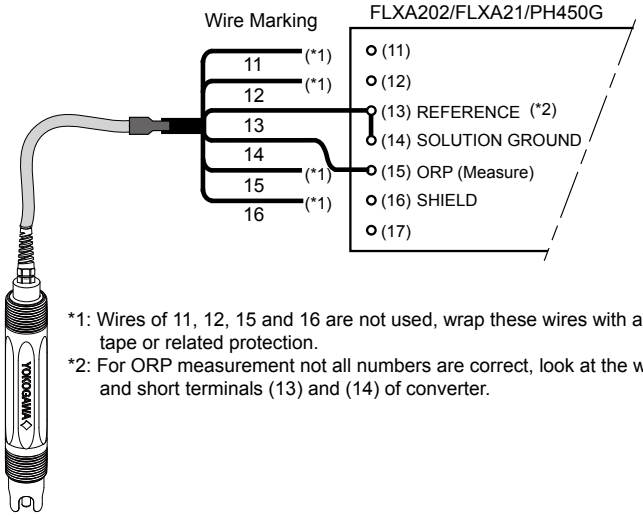


Figure 2.3 Sensor Wiring for pH measurement

For ORP measurement



*1: Wires of 11, 12, 15 and 16 are not used, wrap these wires with an insulating tape or related protection.
*2: For ORP measurement not all numbers are correct, look at the wiring diagram and short terminals (13) and (14) of converter.

Figure 2.4 Sensor Wiring for ORP measurement

3. Maintenance

The sensor has limited life. If buffer solution calibration becomes impossible due to deterioration of the sensor, replace it with a new one. After the sensor is replaced, always carry out a buffer solution calibration.

NOTE

A glass electrode whose glass membrane has dried out does not provide stable readings until it gets used to the solution. Place in advance the glass electrode in the 3 mol/L KCl solution for several hours. When storing the sensor, use a sensor cap (supplied with it on shipment) to its tip.

Cleaning Electrode and Liquid Junction

Staining of an electrode or liquid junction can cause measurement errors. Therefore, if he measured solutions tend to stain the electrode, the electrode and liquid junction must be cleaned periodically - depending on the degree of staining.

To clean the sensor, proceed as follows:

(1) Take out the sensor.

(2) Clean the electrode or liquid junction as follows. Different cleaning solutions may be required depending on the staining.

- Stains due to suspended Solids, Sticky Materials, Microbes or the like

  Using soft tissue paper, wipe the stains off the electrode or liquid junction. In addition, clean off remaining stains by rinsing with water.

- Stains due to Oily Materials

  Wash off stains by submerging in a neutral detergent solution in a beaker, etc, (for from several tens of minutes to several hours depending on the degree of staining).

- Chemical Stains such as due to Metallic Adsorption

  Place the electrode or liquid junction in a diluted hydrochloric acid solution (1 to 2%) for several minutes (acid washing). Afterwards rinse the sensor with water.

- Protein Deposits

  It should be removed with a protein enzymatic solution. For instance a solution containing 8.5 mL concentrated hydrochloric acid and 10 gram pepsin in 1 liter water will do.

(3) Check deterioration of the sensor.

(4) Calibrate the sensor with buffer solution.

(5) Mount the sensor again.

CAUTION

Avoid using non-polar solvent like tri-chloro ethylene, toluene or hexane. Cleaning with iso-propanol or methanol is acceptable.

The non-polar solvents will break up the gel-layer on the glass bulb and requires that the electrode to be soaked in water for at least 12 hours before functioning normally again.

The Teflon (PTFE) diaphragm of the sensor can sometimes be regenerated by putting it in hot (approx. 70°C) 3 molar Potassium Chlorine (KCl) solution and letting it cool to room temperature.

For details of calibration procedure, refer to relevant user's manual of transmitter/converter.

Blank Page

Revision Information

- Title : Model FU20 pH/ORP Sensor
- Manual No. : IM 12B07K02-01E

Oct. 2015/3rd Edition

Added FLXA202, Deleted PH400G/OR400G

Pi, P1-1, P2-2

Supplement of 2nd Edition;

Page 1-2, Some revision of FU20 external dimensions.

Page 2-1, Some revision of Sec. 2.1.1 (how to apply Teflon tape to the thread end of sensor body).

Mar. 2013/2nd Edition Allover revised by InDesign format

P ii to iv, “For the safe use of this equipment” and “After-sales Warranty” added;

P 1-1, Some revision of standard specifications, option code of "/NAG" deleted for "Model- and suffix codes FU20";

P 1-2, Some revision of external dimensions;

P 2-1, Some revision of "Installation", and "In-line Installation" added (screw-in torque changed);

P 2-2, Some revision of "Wiring" with combined transmitter/converter,
(conduct wiring according only to the marking numbers attached onto the core wires as referring to the corresponding figure, and disregard the color codes of the core wires.) ;

P 3-1, Some revision of "Maintenance" procedure and caution of cleaing sensor added;

Last page, Addition of "Revision Information".

Nov. 2000/1st Edition

Newly published.

■ If you want to have more information about Yokogawa products, you can visit Yokogawa’s home page at the following web site.
Home page: http://www.yokogawa.com/an

Blank Page